



Illinois Department of Transportation

To: Anthony J. Quigley Attn: John Baczek
From: Jack Elston By: Michael Brand *MB*
Subject: Pavement Design Approval
Date: April 5, 2018

Route: IL 47 Job No.: D-91-011-14
Section: Section 105-N-2(15) Contract No.: 62B43
County: McHenry Target Letting: 6-2019
Limits: Ballard Road to South of IL 176

We have reviewed the pavement design for the above referenced project which was submitted on March 5, 2018. The scope of the project is to reconstruct IL 47 to provide two through-lanes in each direction and to improve the intersections with IL 176 and Pleasant Valley Road.

Reconstruction of IL 47 - The part of the design resulted in two options for the pavement reconstruction: 10.5" Full-Depth HMA and 9.5" Jointed PCC. The life-cycle cost analysis of those two options resulted in the HMA pavement being 19.7% less expensive (\$164,510 per mile as opposed to PCC's \$196,929) and thus the preferred option.

Reconstruction of IL 176 - The part of the design resulted in two options for the pavement reconstruction: 10" Full-Depth HMA and 9" Jointed PCC. The life-cycle cost analysis of those two options resulted in the HMA pavement being 20.2% less expensive (\$163,930 per mile as opposed to PCC's \$197,101) and thus the preferred option.

In summary, the approved pavement designs are as follows:

IL 47 Reconstruction

10.5" Full-Depth HMA Pavement with HMA Shoulders/PCC Curb & Gutter
12" Aggregate Subgrade Improvement

IL 176 Reconstruction

10" Full-Depth HMA Pavement with HMA Shoulders/PCC Curb & Gutter
12" Aggregate Subgrade Improvement

If you have any questions, please contact Mike Brand at (217) 782-7651.



Illinois Department of Transportation

Memorandum

To: Maureen Addis

Attn: Michael Brand

From: Jose A. Dominguez

By: Ojas Patel

Subject: Pavement Analysis*

Date: March 5, 2018

*Route: Illinois Route 47
Limits: at Illinois Route 176
Section: 105-N-2(15)
Current target: 06CY19

County: McHenry
Contract No.: 62B43
Job No.: D-91-011-14

We have completed the pavement analysis for the above captioned location. Review by the Central Office is required since the total pavement area for reconstruction exceeds 4,750 Square Yards. The following is the scope of the project:

Reconstruction of IL 47 and IL 176 to provide two through lanes in each direction and to realign Pleasant Valley Road to create a four-legged intersection with IL 176.

A 20-year pavement analysis was performed on the above segments. We recommend a mechanistic flexible pavement design as follows based on the life cycle cost analysis which favors HMA pavement by 19.7% for IL 47 and by 20.2% for IL 176.

IL 47

Reconstruction

HMA Shoulder/Portions PCC Curb and Gutter⁴

10 ½" Full Depth HMA^{1,5}

2" Polymerized HMA Surface Course, Mix "E", N70

2 ¼" Polymerized HMA Binder Course, IL-19.0, N90

6 ¼" HMA Base Course, IL-19.0, N90

12" Aggregate Subgrade Improvement³

IL 176

Reconstruction

HMA Shoulder/Portions PCC Curb and Gutter⁴

10" Full Depth HMA^{2,5}

2" Polymerized HMA Surface Course, Mix "E", N70

2 ¼" Polymerized HMA Binder Course, IL-19.0, N90

5 ¾" HMA Base Course, IL-19.0, N90

12" Aggregate Subgrade Improvement³

M. Addis
March 5, 2018
Page Two

¹Designer Note 1: Use pay item **40701891, HOT-MIX ASPHALT PAVEMENT (FULL-DEPTH), 10 ½"**, paid for in square yards.

²Designer Note 2: Use pay item **40701881, HOT-MIX ASPHALT PAVEMENT (FULL-DEPTH), 10"**, paid for in square yards.

³Designer Note 3: Use pay item **30300112, AGGREGATE SUBGRADE IMPROVEMENT, 12"**, paid in square yards.

⁴Designer Note 4: The designer should utilize IDOT Highway Standards in conjunction with guidelines in BDE Manual 34-2.02 if necessary for shoulder thicknesses.

⁵Designer Note 5: Refer to the District One, Bureau of Materials' "Hot-Mix Asphalt – Mix Selection" tables to determine the corresponding HMA mix table requirements for the plans.

If you have any questions or need additional information, please contact Ojas Patel, Pavement Design Engineer, at (847)705-4550.

By: 
Jose A. Dominguez, P.E.
Project Support Engineer

SUBSURFACE UTILITY ENGINEERING (S.U.E.)
UTILIZED ON THIS PROJECT

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

FOR INDEX OF SHEETS, SEE SHEET NO. 2
FOR LIST OF HIGHWAY STANDARDS, SEE SHEET NO. 3

CITY OF WOODSTOCK
VILLAGE OF LAKEWOOD

IL ROUTE 47
POSTED SPEED LIMIT = 55 MPH

IL ROUTE 176
POSTED SPEED LIMIT = 55 MPH

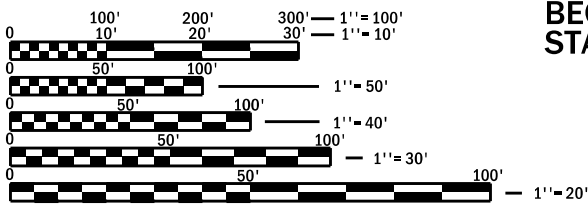
PLEASANT VALLEY ROAD
POSTED SPEED LIMIT = 45 MPH

END IMPROVEMENT
STA. 660+91.74

IL ROUTE 47 FUNCTIONAL CLASSIFICATION:
OTHER PRINCIPAL ARTERIAL
ADT = 20,800

IL ROUTE 176 FUNCTIONAL CLASSIFICATION:
OTHER PRINCIPAL ARTERIAL
ADT = 10,100

PLEASANT VALLEY ROAD FUNCTIONAL CLASSIFICATION:
COLLECTOR (URBAN)
ADT = 1,050



FULL SIZE PLANS HAVE BEEN PREPARED USING STANDARD
ENGINEERING SCALES. REDUCED SIZED PLANS WILL NOT
CONFORM TO STANDARD SCALES. IN MAKING MEASUREMENTS
ON REDUCED PLANS, THE ABOVE SCALES MAY BE USED.

J.U.L.I.E.
JOINT UTILITY LOCATION INFORMATION FOR EXCAVATION
1-800-892-0123
OR 811

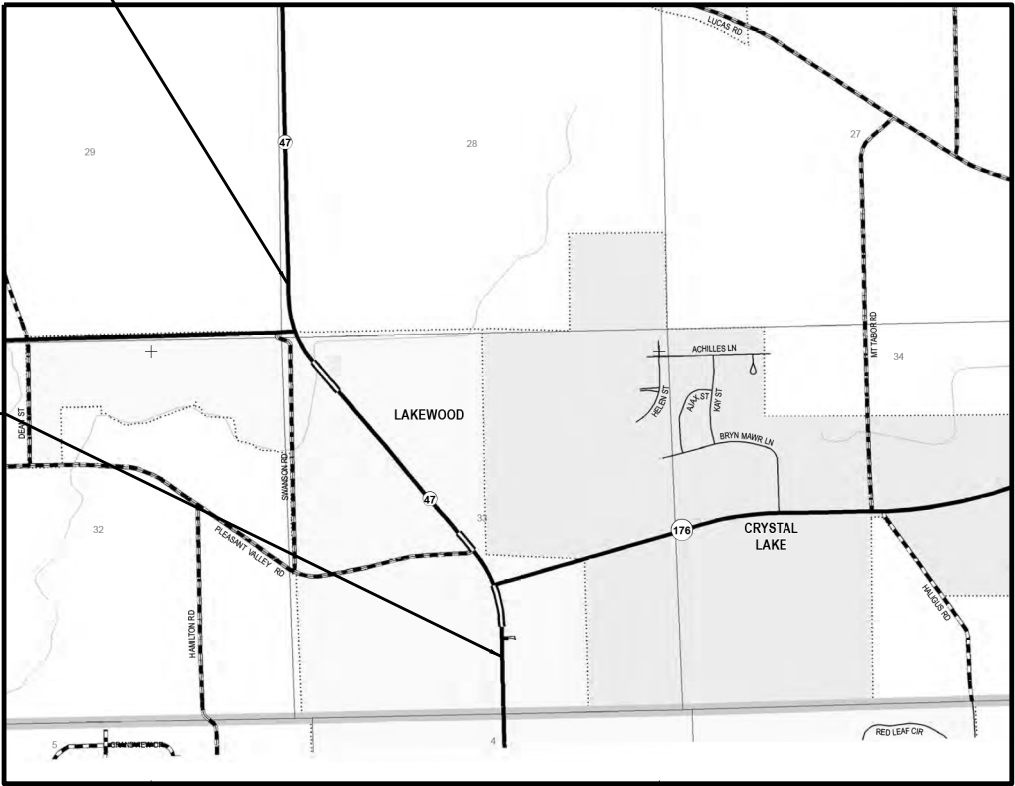
PROJECT ENGINEER: MARC GRIGAS, P.E. (STRAND) 815-744-4200
PROJECT MANAGER: MATTHEW ROTHENBERG, P.E. (IDOT) 847-705-4230

CONTRACT NO. 62B43

PROPOSED
HIGHWAY PLANS

FAP ROUTE 326 (IL ROUTE 47)
SECTION 105-N-2(15)
N OF BALLARD RD TO S OF IL 176
PROJECT
WIDENING
MCHENRY COUNTY

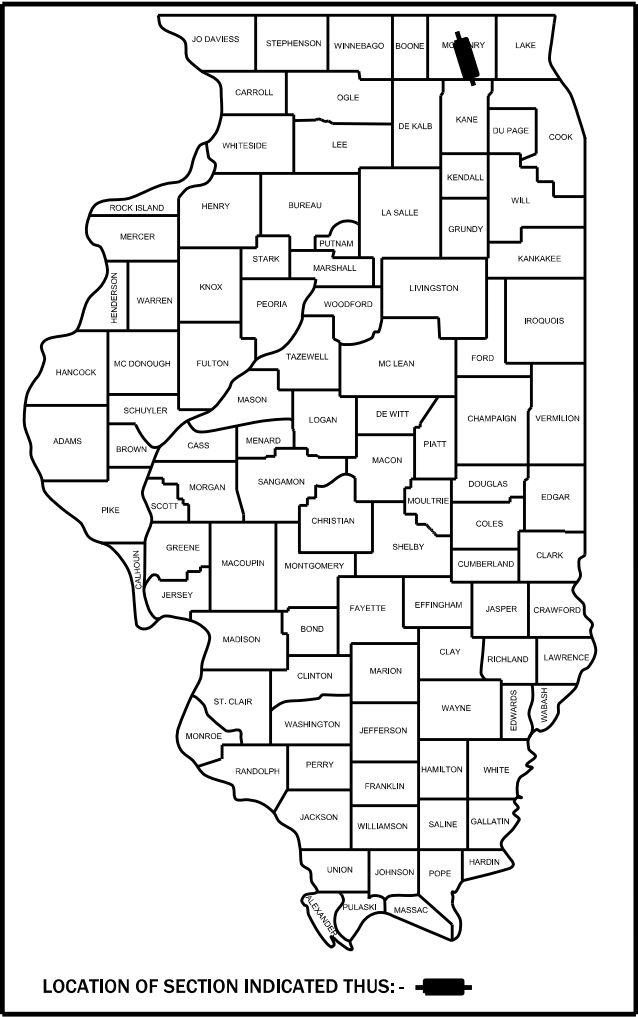
C-91-011-14



GROSS LENGTH = 8820.00 FT. = 1.670 MILE
NET LENGTH = 8820.00 FT. = 1.670 MILE

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
326	105-N-2(15)	MCHENRY	\$TOTS	1
		ILLINOIS	CONTRACT NO. 62B43	

D-91-011-14





1170 SOUTH HOUBOLT ROAD
JOLIET, ILLINOIS 60431
(815) 744-4200
IDFPR NO. 184-001273

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

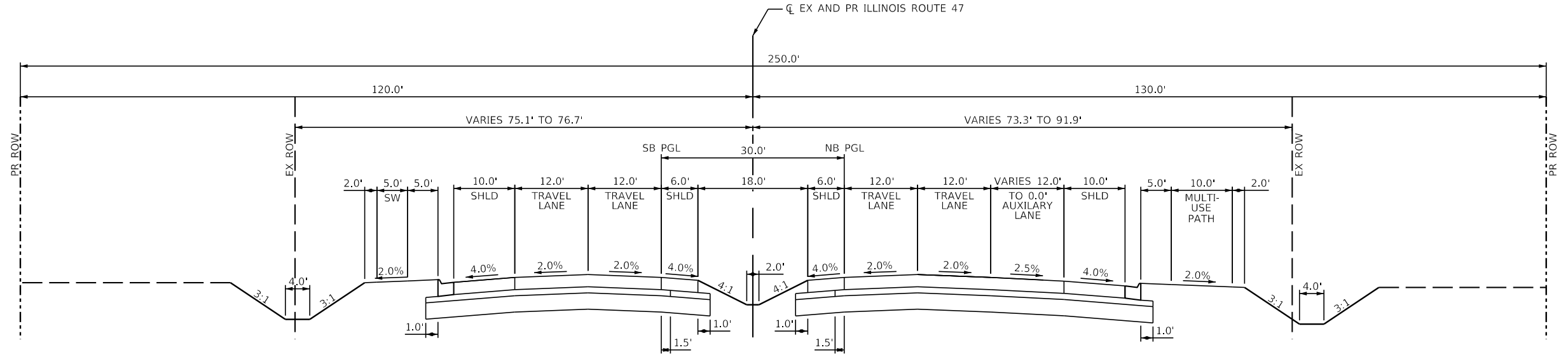
SUBMITTED _____ 20 _____

REGIONAL ENGINEER

ENGINEER OF DESIGN AND ENVIRONMENT

DIRECTOR OF PROGRAM DEVELOPMENT

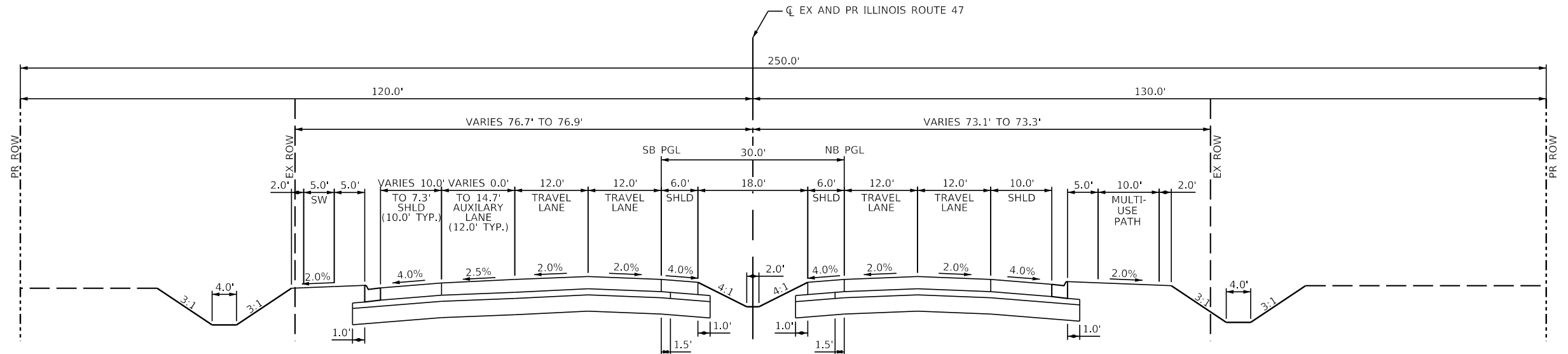
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ILLINOIS ROUTE 47 PROPOSED TYPICAL SECTION

STA. 595+78.70 TO STA. 618+90.82
STA. 640+15.57 TO STA. 654+50.00

* SEE SUPERELEVATION TABLES 5 AND 6 FOR GRADES FROM STA. 626+56.63 TO STA. 641+34.46

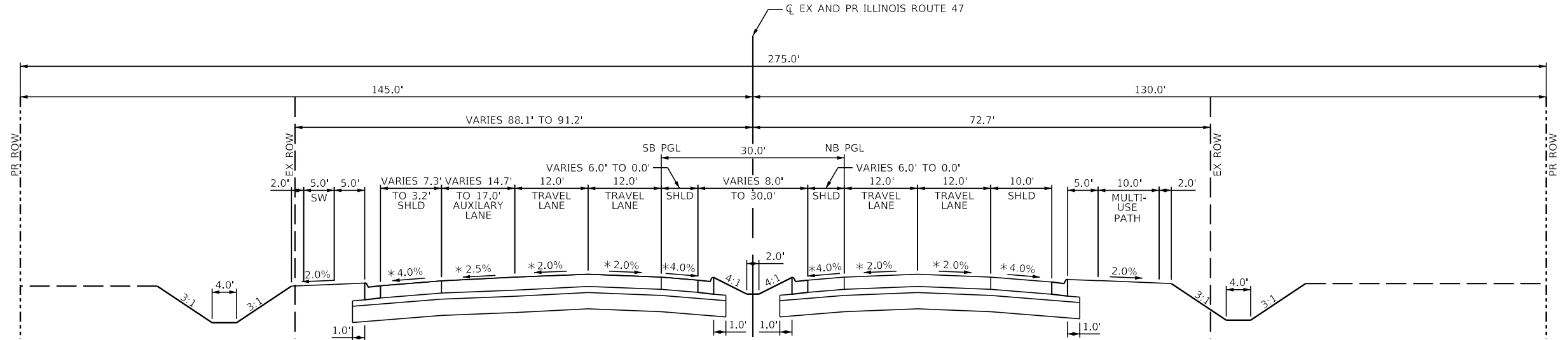


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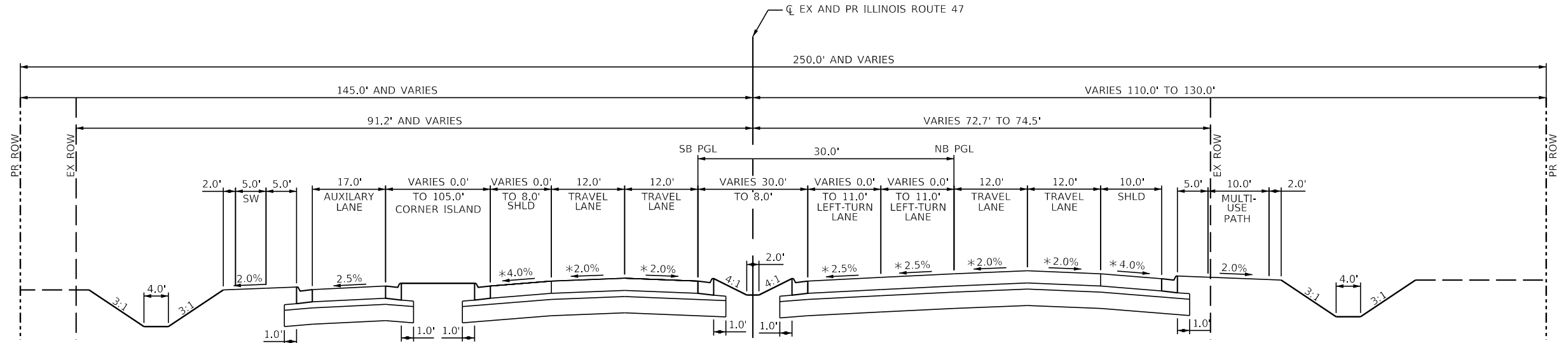
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ILLINOIS ROUTE 47 PROPOSED TYPICAL SECTION

STA. 626+54.46 TO STA. 627+74.37

* SEE SUPERELEVATION TABLES 5 AND 6 FOR GRADES FROM STA. 626+56.63 TO STA. 641+34.46



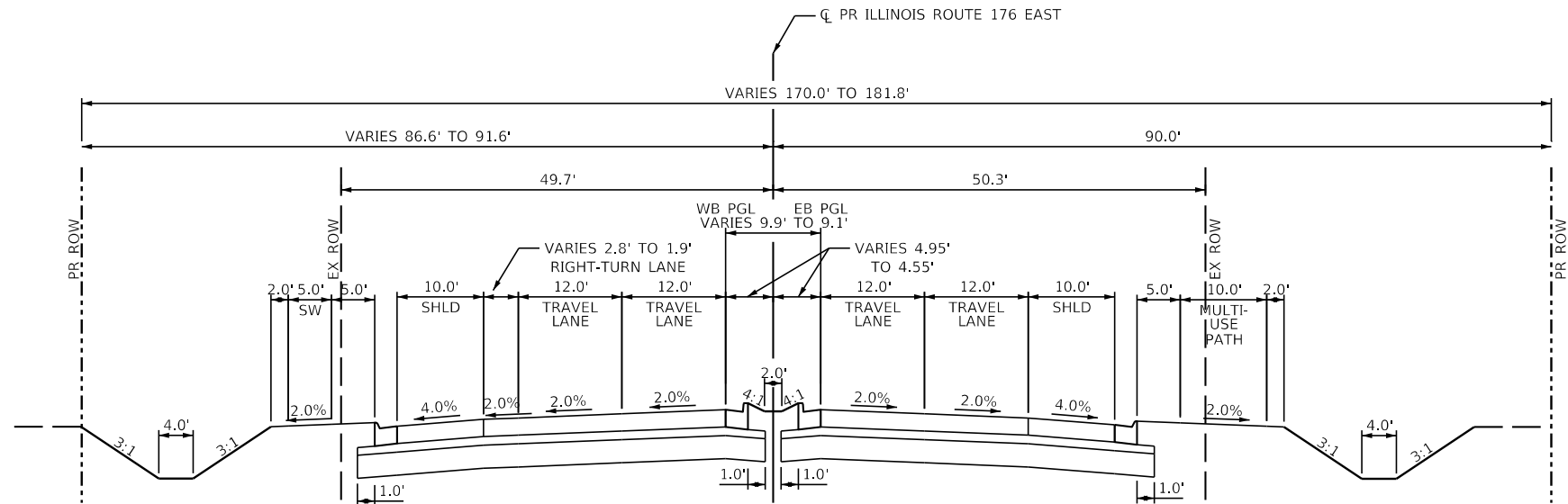
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STA. 627+74.37 TO STA. 633+84.58

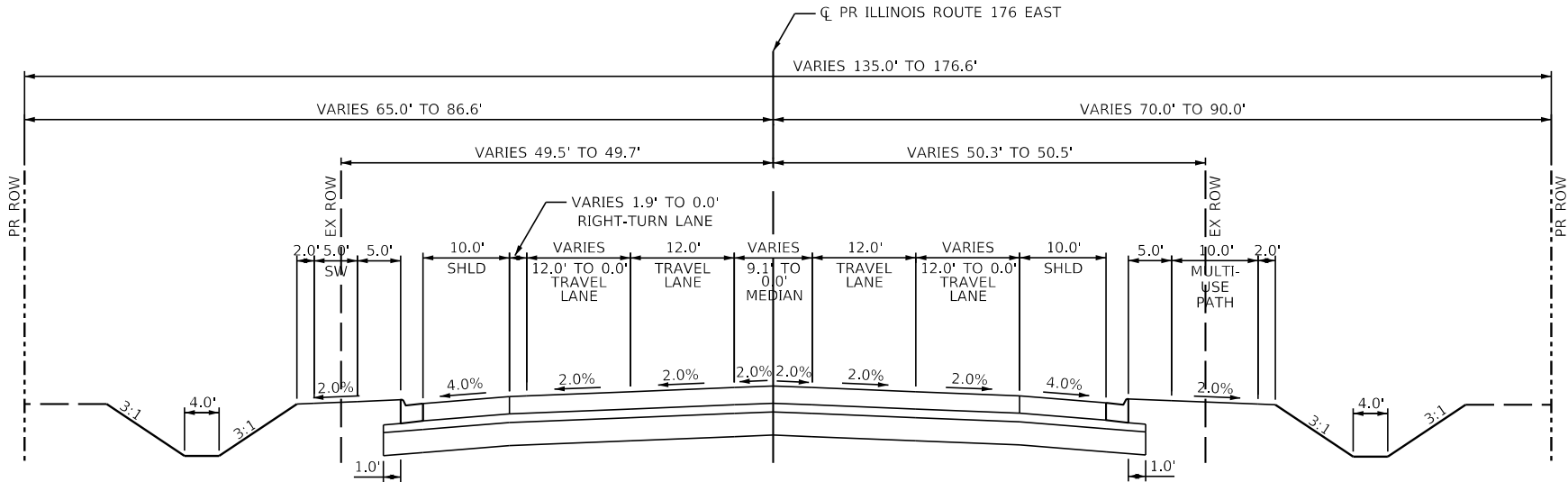
* SEE SUPERELEVATION TABLES 5 AND 6 FOR GRADES FROM STA. 626+56.63 TO STA. 641+34.46

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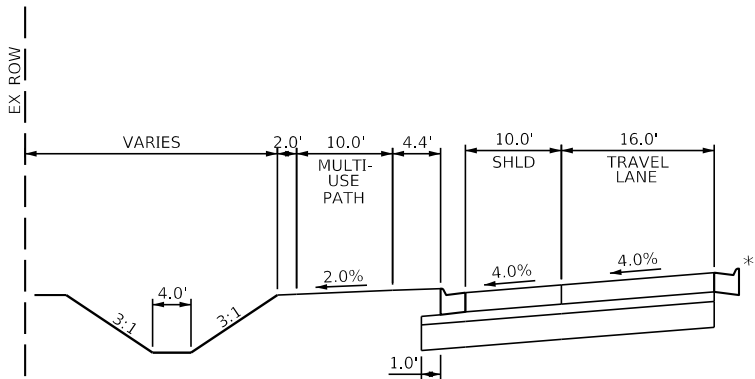
 <div>1170 SOUTH HOUBOLT ROAD JOLIET, ILLINOIS 60431 (815) 744-4200</div>	USER NAME = mattg		DESIGNED -	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	ILLINOIS ROUTE 47 TYPICAL SECTIONS				F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
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	PLOT DATE = 12/20/2017		DATE -	REVISED -					ILLINOIS FED. AID PROJECT					



ILLINOIS ROUTE 176 EAST PROPOSED TYPICAL SECTION
STA. 308+17.20 TO STA. 308+37.69



ILLINOIS ROUTE 176 EAST PROPOSED TYPICAL SECTION
STA. 308+37.69 TO STA. 316+64.74



ILLINOIS ROUTE 176 EAST RIGHT TURN BYPASS PROPOSED TYPICAL SECTION
* SEE CROSS SECTIONS FOR CORNER ISLAND DETAIL

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1170 SOUTH HOUBOLT ROAD
JOLIET, ILLINOIS 60431
(815) 744-4200

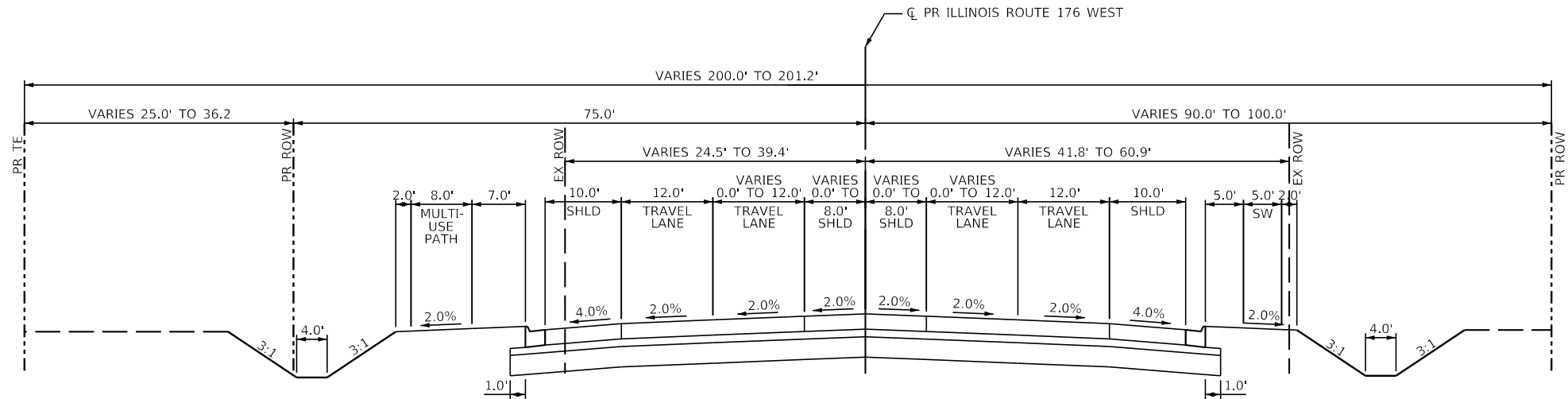
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STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

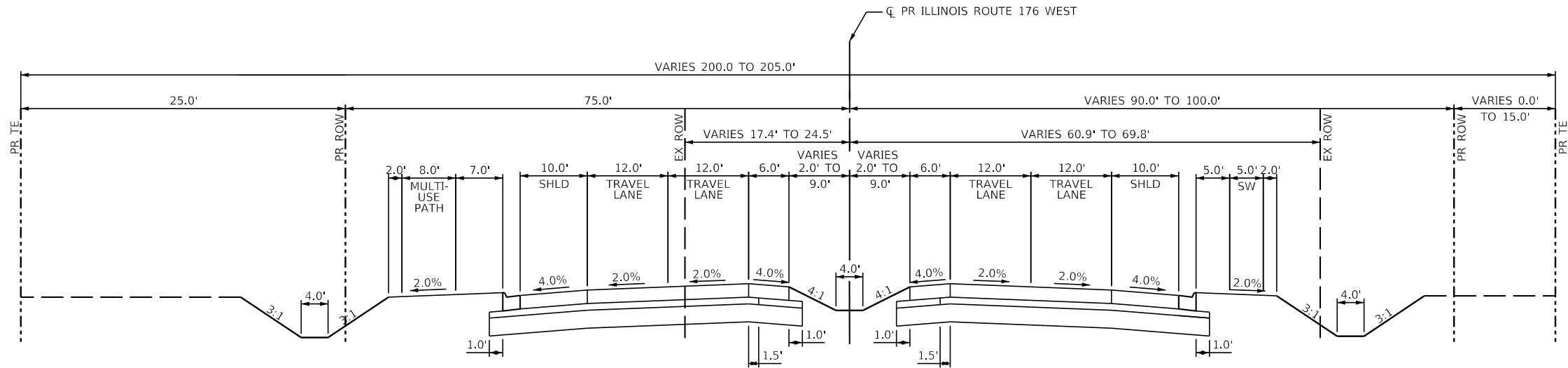
ILLINOIS ROUTE 176 EAST TYPICAL SECTIONS

SCALE: SHEET OF SHEETS STA. TO STA.

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
CONTRACT NO.				
ILLINOIS FED. AID PROJECT				



ILLINOIS ROUTE 176 WEST PROPOSED TYPICAL SECTION
STA. 404+20.04 TO STA. 415+47.95



ILLINOIS ROUTE 176 WEST PROPOSED TYPICAL SECTION
STA. 415+47.95 TO STA. 420+79.60

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JOLIET, ILLINOIS 60431
(815) 744-4200

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STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

ILLINOIS ROUTE 176 WEST TYPICAL SECTIONS

SCALE: SHEET OF SHEETS STA. TO STA.

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
CONTRACT NO.				
ILLINOIS FED. AID PROJECT				

FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE IL 47
SECTION 105-N-2(15)
COUNTY McHenry
LOCATION at IL 176

FACILITY TYPE NON-INTERSTATE

PROJECT LENGTH 10040 FT == > 1.90 Miles
OF CENTERLINES 6 CL
OF LANES 4 LANES
OF EDGES 4 EP
LANE WIDTH - AVERAGE 12 FT
SHOULDER WIDTH HMA Inside 6 FT
HMA Outside 10 FT
Total Width of Paved Shoulders 32 FT

PAVEMENT THICKNESS (FLEXIBLE) 10.50 IN 14.25 IN MAX
SHOULDER THICKNESS 8.00 IN HMA_SD Standard Design
POLICY OVERLAY THICKNESS 2.25 IN

FLEX PAVEMENT TRAFFIC FACTORS MINIMUM ACTUAL USE
3.56 5.03 5.03

HMA COST PER TON UNIT PRICE
HMA SURFACE \$86.91 / TON
HMA TOP BINDER \$81.24 / TON
HMA LOWER BINDER \$77.50 / TON
HMA BINDER (LEVELING) \$81.25 / TON
HMA SHOULDER \$72.00 / TON

INITIAL COSTS ITEM	THICKNESS	100% QUAI UNIT	UNIT PRICE	COST
HMA PAVEMENT (FULL-DEPTH)	(10.50")	53547 53,547 SQ YD *	\$47.56 / SQ YD	\$2,546,679 ~
HMA SURFACE COURSE	(2.00")	1.0069 6,039 TONS	\$86.91 / TON	\$0
HMA TOP BINDER COURSE	(2.25")	1.0217 6,893 TONS	\$81.24 / TON	\$0
HMA LOWER BINDER COURSE	(6.25")	1.0512 19,701 TONS	\$77.50 / TON	\$0
HMA SHOULDER	(8.00")	35698 15,993 TONS	\$72.00 / TON	\$1,151,468 ~
CURB & GUTTER		0 LIN FT	\$30.00 / LIN FT	\$0
SUBBASE GRAN MATL TY C (TONS)		1,852 TONS	\$25.00 / TON	\$46,300
IMPROVED SUBGRADE:	Aggregate Width = 85.5	95,380 SQ YD	\$7.00 / SQ YD	\$667,660
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		53,547 SQ YD	\$15.00 / SQ YD	\$803,205
SHOULDER REMOVAL		35,698 SQ YD	\$10.00 / SQ YD	\$356,980

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCT' \$5,572,292
FLEXIBLE CONSTRUCT' \$119,519

MAINTENANCE COSTS: ITEM	THICKNESS	MATERIAL T	UNIT COST
ROUTINE MAINTENANCE ACTIVITY			\$0.00 LANE-MILE / YEAR
HMA OVERLAY PVMT SURF	(2.00")	1.0069 Surface M 2.00	\$9.80 / SQ YD
HMA OVERLAY PVMT	(2.25")	1.0078 2.25	\$10.80 / SQ YD
HMA SURFACE MIX	(1.50")	1.0052 Surface M 1.50	\$7.34 / SQ YD
HMA BINDER MIX	(0.75")	1.0130 Leveling Binc 0.75	\$3.46 / SQ YD
HMA OVERLAY SHLD (Year 30)	(2.25")	Shoulder 2.25	\$9.07 / SQ YD
HMA OVERLAY SHLD	(2.00")	Shoulder 2.00	\$8.06 / SQ YD
MILLING (2.00 IN)		2.00	\$3.00 / SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill Surf)	Surface M 2.00	\$79.73 / SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill Surf)	Shoulder 2.00	\$78.06 / SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill +2.00 ")	Leveling Binc 2.00	\$79.10 / SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill +2.00 ")	Shoulder 2.00	\$78.06 / SQ YD

LONGITUDINAL SHOULDER JOINT ROUT & SEAL		\$2.00 / LIN FT	
CENTERLINE JOINT ROUT & SEAL		\$2.00 / LIN FT	
RANDOM / THERMAL CRACK ROUT & SEAL	(100% Ref	\$2.00 / LIN FT	
FLEXIBLE TOTAL LIFE-			\$7,669,896
FLEXIBLE TOTAL ANNI			\$164,510

PCC PAVEMENT

JPCP

ROUTE
SECTION
COUNTY
LOCATION

IL 47
105-N-2(15)
McHenry
at IL 176

FACILITY TYPE

NON-INTERSTATE

PROJECT LENGTH 10040 FT == > 1.90 Miles
OF CENTERLINES 6 CL
OF LANES 4 LANES
OF EDGES 4 EP
LANE WIDTH - AVERAGE 12 FT
SHOULDER WIDTH PCC Inside 6 FT
PCC Outside 10 FT
Total Width of Paved Shoulders 32 FT

PAVEMENT THICKNESS (RIGID) JPCP 9.50 IN TIED SHLD
SHOULDER THICKNESS 9.50 IN

POLICY OVERLAY THICKNESS 2.50 IN

RIGID PAVEMENT TRAFFIC FACTORS MINIMUM ACTUAL USE
5.02 6.94
Worksheet Construction Type is Reconstruction The Pavement Type is JPCP 6.94

INITIAL COSTS ITEM	THICKNESS	100% QUA UNIT	UNIT PRICE	COST
JPC PAVEMENT	(9.50")	53,547 SQ YD	\$66.40 / SQ YD	\$3,555,521
PAVEMENT REINFORCEMENT		0 SQ YD	\$22.00 / SQ YD	\$0
STABILIZED SUBBASE	(4.00")	60,240 SQ YD	\$19.00 / SQ YD	\$1,144,560
PCC SHOULDERS	(9.50" to 9.50")	35,698 SQ YD	\$40.00 / SQ YD	\$1,427,920
CURB & GUTTER		0 LIN FT	\$30.00 / LIN FT	\$0
SUBBASE GRAN MATL TY C	(~ 3.48")	4,200 TONS	\$25.00 / TON	\$105,000
IMPROVED SUBGRADE:	Aggregate Width = 82.0	91,476 SQ YD	\$7.00 / SQ YD	\$640,332
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		53,547 SQ YD	\$15.00 / SQ YD	\$803,205
SHOULDER REMOVAL		35,698 SQ YD	\$10.00 / SQ YD	\$356,980

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION \$8,033,518
RIGID CONSTRUCTION \$172,309

MAINTENANCE COSTS:
ITEM THICKNESS MATERIAL T UNIT COST

ROUTINE MAINTENANCE ACTIVITY \$0.00 / LANE-MILE / YEAR

HMA POLICY OVERLAY	(2.50")		2.50	
HMA POLICY OVERLAY PVMT	(2.50")	1.0087	2.50	\$11.95 / SQ YD
HMA SURFACE MIX	(1.50")	1.0052	Surface M	\$7.34 / SQ YD
HMA BINDER MIX	(1.00")	1.0139	Leveling Binc	\$4.61 / SQ YD
HMA POLICY OVERLAY SHLD	(2.50")		Shoulder	\$10.08 / SQ YD

CLASS A PAVEMENT PATCHING				\$195.00 / SQ YD
CLASS B PAVEMENT PATCHING				\$150.00 / SQ YD
CLASS C SHOULDER PATCHING				\$145.00 / SQ YD

PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)		Surface M	1.50	\$77.30 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.50")		Surface M	2.50	\$82.17 / SQ YD

LONGITUDINAL SHOULDER JOINT ROUT & SEAL				\$2.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL				\$2.00 / LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL				\$2.00 / LIN FT
RANDOM CRACK ROUT & SEAL		(100% Rehab = 100.00' /		\$2.00 / LIN FT

RIGID TOTAL LIFE-C \$9,181,374
RIGID TOTAL ANNUAL \$196,929

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Re #####

		JPCP		HMA
		PRESENT '1	ANNUAL C	
CONSTRUCTION	INITIAL COST	\$8,033,518		\$5,572,292
			\$172,309	\$119,519
MAINTENANCE	LIFE-CYCLE COST	\$1,147,856		\$2,097,604
			\$24,620	\$44,991
TOTAL	LIFE-CYCLE COST	\$9,181,374		\$7,669,896
			\$196,929	\$164,510

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	===== HMA	\$164,510	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PE JPCP	\$196,929	19.7%

S:\GEN\WPDOCS\Pavement Designs\ID-1\IL 47 - Ballard Rd to IL 176 - 62B43\IL 47 - IDOT Mech Pvrmt Dgn LCCA 09-05-13.xlsm]PDFSheets

FULL-DEPTH HMA PAVEMENT
HMA OVERLAY OF RUBBLIZED PCC PAVEMENT
Figure 54-7.C
STANDARD DESIGN

MAINTENANCE ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 5						
LONG SHLD JT R&S	100.00%	40,160	LIN FT	\$2.00	\$80,320	
CNTR LINE JOINT R&S	100.00%	60,240	LIN FT	\$2.00	\$120,480	
RNDM / THRM CRACK R&S	50.00%	22,088	LIN FT	\$2.00	\$44,176	
PD PVMT PATCH M&F SURF	0.10%	54	SQ YD	\$79.73	\$4,306	
PWFn =	0.8626		PW =	0.8626 X	\$249,282	\$215,033
YEAR 10						
LONG SHLD JT R&S	100.00%	40,160	LIN FT	\$2.00	\$80,320	
CNTR LINE JOINT R&S	100.00%	60,240	LIN FT	\$2.00	\$120,480	
RNDM / THRM CRACK R&S	50.00%	22,088	LIN FT	\$2.00	\$44,176	
PD PVMT PATCH M&F SURF	0.50%	268	SQ YD	\$79.73	\$21,369	
PWFn =	0.7441		PW =	0.7441 X	\$266,345	\$198,186
YEAR 15						
MILL PVMT & SHLD 2.00"	100.00%	89,244	SQ YD	\$3.00	\$267,732	
PD PVMT PATCH M&F ADD'L 2.00"	1.00%	535	SQ YD	\$79.10	\$42,319	
HMA OVERLAY PVMT 2.00"	100.00%	53,547	SQ YD	\$9.80	\$524,839	
HMA OVERLAY SHLD 2.00 "	100.00%	35,698	SQ YD	\$8.06	\$287,867	
PWFn =	0.6419		PW =	0.6419 X	\$1,122,757	\$720,655
YEAR 20						
LONG SHLD JT R&S	100.00%	40,160	LIN FT	\$2.00	\$80,320	
CNTR LINE JOINT R&S	100.00%	60,240	LIN FT	\$2.00	\$120,480	
RNDM / THRM CRACK R&S	50.00%	22,088	LIN FT	\$2.00	\$44,176	
PD PVMT PATCH M&F SURF	0.10%	54	SQ YD	\$79.73	\$4,306	
PWFn =	0.5537		PW =	0.5537 X	\$249,282	\$138,021
YEAR 25						
LONG SHLD JT R&S	100.00%	40,160	LIN FT	\$2.00	\$80,320	
CNTR LINE JOINT R&S	100.00%	60,240	LIN FT	\$2.00	\$120,480	
RNDM / THRM CRACK R&S	50.00%	22,088	LIN FT	\$2.00	\$44,176	
PD PVMT PATCH M&F SURF	0.50%	268	SQ YD	\$79.73	\$21,369	
PWFn =	0.4776		PW =	0.4776 X	\$266,345	\$127,208
YEAR 30						
NON-INTERSTATE						
MILL PVMT & SHLD 2.00"	100.00%	89,244	SQ YD	\$3.00	\$267,732	
PD PVMT PATCH M&F ADD'L 2.00"	2.00%	1,071	SQ YD	\$79.10	\$84,716	
PD SHLD PATCH M&F ADD'L 2.00"	1.00%	357	SQ YD	\$78.06	\$27,869	
HMA OVERLAY PVMT 2.25 "	100.00%	53,547	SQ YD	\$10.80	\$578,058	
HMA OVERLAY SHLD 2.25 "	100.00%	35,698	SQ YD	\$9.07	\$323,850	
PWFn =	0.4120		PW =	0.4120 X	\$1,282,225	\$528,260
YEAR 35						
LONG SHLD JT R&S	100.00%	40,160	LIN FT	\$2.00	\$80,320	
CNTR LINE JOINT R&S	100.00%	60,240	LIN FT	\$2.00	\$120,480	
RNDM / THRM CRACK R&S	50.00%	22,088	LIN FT	\$2.00	\$44,176	
PD PVMT PATCH M&F SURF	0.10%	54	SQ YD	\$79.73	\$4,306	
PWFn =	0.3554		PW =	0.3554 X	\$249,282	\$88,591
YEAR 40						
LONG SHLD JT R&S	100.00%	40,160	LIN FT	\$2.00	\$80,320	
CNTR LINE JOINT R&S	100.00%	60,240	LIN FT	\$2.00	\$120,480	
RNDM / THRM CRACK R&S	50.00%	22,088	LIN FT	\$2.00	\$44,176	
PD PVMT PATCH M&F SURF	0.50%	268	SQ YD	\$79.73	\$21,369	
PWFn =	0.3066		PW =	0.3066 X	\$266,345	\$81,650
						\$2,097,604
ROUTINE MAINTENANCE ACTIVITY		7.61	Lane Miles	0.00	\$0	\$0
45 YEAR LIFE CYCLE	CRFn = 0.0407852				MAINTENANCE MAINTENANCE	\$2,097,604 \$44,991

JOINTED PLAIN CONCRETE PAVEMENT
UNBONDED JOINTED PLAIN CONCRETE OVERLAY
Figure 54-7.A

MAINTENANCE ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 10						
PAVEMENT PATCH CLASS B	0.10%	54	SQ YD	\$150.00	\$8,100	
PWF _n =	0.7441		PW =	0.7441 X	\$8,100	\$6,027
YEAR 15						
PAVEMENT PATCH CLASS B	0.20%	107	SQ YD	\$150.00	\$16,050	
PWF _n =	0.6419		PW =	0.6419 X	\$16,050	\$10,302
YEAR 20						
PAVEMENT PATCH CLASS B	2.00%	1,071	SQ YD	\$150.00	\$160,650	
SHOULDER PATCH CLASS C	0.50%	178	SQ YD	\$145.00	\$25,810	
LONGITUDINAL SHLD JT R&S	100.00%	40,160	LIN FT	\$2.00	\$80,320	
CENTERLINE JT R&S	100.00%	60,240	LIN FT	\$2.00	\$120,480	
PWF _n =	0.5537		PW =	0.5537 X	\$387,260	\$214,416
YEAR 25						
PAVEMENT PATCH CLASS B	3.00%	1,606	SQ YD	\$150.00	\$240,900	
SHOULDER PATCH CLASS C	1.00%	357	SQ YD	\$145.00	\$51,765	
PWF _n =	0.4776		PW =	0.4776 X	\$292,665	\$139,778
YEAR 30						
NON-INTERSTATE						
PAVEMENT PATCH CLASS B	4.00%	2,142	SQ YD	\$150.00	\$321,300	
SHOULDER PATCH CLASS C	1.50%	535	SQ YD	\$145.00	\$77,575	
HMA POLICY OVERLAY 2.5" (PVMT)	100.00%	53,547	SQ YD	\$11.95	\$639,971	
HMA POLICY OVERLAY 2.5" (SHLD)	100.00%	35,698	SQ YD	\$10.08	\$359,834	
PWF _n =	0.4120		PW =	0.4120 X	\$1,398,680	\$576,238
YEAR 35						
NON-INTERSTATE						
LONGITUDINAL SHLD JT R&S	100.00%	40,160	LIN FT	\$2.00	\$80,320	
CENTERLINE JT R&S	100.00%	60,240	LIN FT	\$2.00	\$120,480	
RANDOM CRACK R&S	50.00%	20,080	LIN FT	\$2.00	\$40,160	
REFLECTIVE TRANSVERSE CRACK R&S	40.00%	12,845	LIN FT	\$2.00	\$25,690	
PD PVMT PATCH M&F HMA 2.50"	0.10%	54	SQ YD	\$82.17	\$4,437	
PWF _n =	0.3554		PW =	0.3554 X	\$271,087	\$96,340
YEAR 40						
NON-INTERSTATE						
PAVEMENT PATCH CLASS B	0.50%	268	SQ YD	\$150.00	\$40,200	
LONGITUDINAL SHLD JT R&S	100.00%	40,160	LIN FT	\$2.00	\$80,320	
CENTERLINE JT R&S	100.00%	60,240	LIN FT	\$2.00	\$120,480	
REFLECTIVE TRANSVERSE CRACK R&S	60.00%	19,267	LIN FT	\$2.00	\$38,534	
RANDOM CRACK R&S	50.00%	20,080	LIN FT	\$2.00	\$40,160	
PD PVMT PATCH M&F HMA 2.50"	0.50%	268	SQ YD	\$82.17	\$22,021	
PWF _n =	0.3066		PW =	0.3066 X	\$341,715	\$104,755
						\$1,147,856
ROUTINE MAINTENANCE ACTIVITY		7.61	Lane Miles	\$0.00	\$0	\$0
45 YEAR LIFE CYCLE	CRF _n = 0.0407852				MAINTENANCE MAINTENANCE	\$1,147,856 \$24,620

FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE IL 176
SECTION 105-N-2(15)
COUNTY McHenry
LOCATION e/o and w/o IL 47

FACILITY TYPE NON-INTERSTATE

PROJECT LENGTH 4135 FT ==> 0.78 Miles
OF CENTERLINES 6 CL
OF LANES 4 LANES
OF EDGES 4 EP
LANE WIDTH - AVERAGE 12 FT
SHOULDER WIDTH HMA Inside 6 FT
HMA Outside 10 FT
Total Width of Paved Shoulders 32 FT

PAVEMENT THICKNESS (FLEXIBLE) 10.00 IN 14.25 IN MAX
SHOULDER THICKNESS 8.00 IN HMA_SD Standard Design
POLICY OVERLAY THICKNESS 2.25 IN

FLEX PAVEMENT TRAFFIC FACTORS MINIMUM ACTUAL USE
3.56 4.01 4.01

Read Me!

HMA COST PER TON UNIT PRICE
HMA SURFACE \$88.70 / TON
HMA TOP BINDER \$80.67 / TON
HMA LOWER BINDER \$83.27 / TON
HMA BINDER (LEVELING) \$80.67 / TON
HMA SHOULDER \$72.00 / TON

INITIAL COSTS ITEM	THICKNESS	100% QUAI UNIT	UNIT PRICE	COST
HMA PAVEMENT (FULL-DEPTH)	(10.00")	22053 22,053 SQ YD *	\$47.39 / SQ YD	\$1,045,107 ~
HMA SURFACE COURSE	(2.00")	1.0069 2,487 TONS	\$88.70 / TON	\$0
HMA TOP BINDER COURSE	(2.25")	1.0217 2,839 TONS	\$80.67 / TON	\$0
HMA LOWER BINDER COURSE	(5.75")	1.0495 7,453 TONS	\$83.27 / TON	\$0
HMA SHOULDER	(8.00")	14702 6,587 TONS	\$72.00 / TON	\$474,235 ~
CURB & GUTTER		0 LIN FT	\$30.00 / LIN FT	\$0
SUBBASE GRAN MATL TY C (TONS)		330 TONS	\$25.00 / TON	\$8,250
IMPROVED SUBGRADE:	Aggregate Width = 85.3	39,206 SQ YD	\$7.00 / SQ YD	\$274,442
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		22,053 SQ YD	\$15.00 / SQ YD	\$330,795
SHOULDER REMOVAL		14,702 SQ YD	\$10.00 / SQ YD	\$147,020

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCT' \$2,279,849
FLEXIBLE CONSTRUCT' \$118,732

MAINTENANCE COSTS: ITEM	THICKNESS	MATERIAL T	UNIT COST
ROUTINE MAINTENANCE ACTIVITY			\$0.00 LANE-MILE / YEAR
HMA OVERLAY PVMT SURF	(2.00")	1.0069 Surface M 2.00	\$10.00 / SQ YD
HMA OVERLAY PVMT	(2.25")	1.0078 2.25	\$10.92 / SQ YD
HMA SURFACE MIX	(1.50")	1.0052 Surface M 1.50	\$7.49 / SQ YD
HMA BINDER MIX	(0.75")	1.0130 Leveling Binc 0.75	\$3.43 / SQ YD
HMA OVERLAY SHLD (Year 30)	(2.25")	Shoulder 2.25	\$9.07 / SQ YD
HMA OVERLAY SHLD	(2.00")	Shoulder 2.00	\$8.06 / SQ YD
MILLING (2.00 IN)		2.00	\$3.00 / SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill Surf)	Surface M 2.00	\$79.93 / SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill Surf)	Shoulder 2.00	\$78.06 / SQ YD
PARTIAL DEPTH PVMT PATCH	(Mill & Fill +2.00 ")	Leveling Binc 2.00	\$79.04 / SQ YD
PARTIAL DEPTH SHLD PATCH	(Mill & Fill +2.00 ")	Shoulder 2.00	\$78.06 / SQ YD

LONGITUDINAL SHOULDER JOINT ROUT & SEAL
CENTERLINE JOINT ROUT & SEAL
RANDOM / THERMAL CRACK ROUT & SEAL

	\$2.00 / LIN FT
	\$2.00 / LIN FT
(100% Ref	\$2.00 / LIN FT

FLEXIBLE TOTAL LIFE-	\$3,147,730
FLEXIBLE TOTAL ANNI	\$163,930

PCC PAVEMENT

JPCP

ROUTE
SECTION
COUNTY
LOCATION

IL 176
105-N-2(15)
McHenry
e/o and w/o IL 47

FACILITY TYPE

NON-INTERSTATE

PROJECT LENGTH	4135 FT	== >	0.78 Miles
# OF CENTERLINES	6 CL		
# OF LANES	4 LANES		
# OF EDGES	4 EP		
LANE WIDTH - AVERAGE	12 FT		
SHOULDER WIDTH	PCC Inside 6 FT		
	PCC Outside 10 FT		
	Total Width of Paved Shoulders 32 FT		

PAVEMENT THICKNESS (RIGID)	JPCP	9.00 IN	TIED SHLD
SHOULDER THICKNESS		9.00 IN	

POLICY OVERLAY THICKNESS	2.50 IN
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RIGID PAVEMENT	TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
		5.02	5.54	5.54
Worksheet Construction Type is	Reconstruction		The Pavement Type is	JPCP

INITIAL COSTS ITEM	THICKNESS	100% QUA UNIT	UNIT PRICE	COST
JPC PAVEMENT	(9.00")	22,053 SQ YD	\$66.50 / SQ YD	\$1,466,525
PAVEMENT REINFORCEMENT		0 SQ YD	\$22.00 / SQ YD	\$0
STABILIZED SUBBASE	(4.00")	24,810 SQ YD	\$19.00 / SQ YD	\$471,390
PCC SHOULDERS	(9.00" to 9.00")	14,702 SQ YD	\$40.00 / SQ YD	\$588,080
CURB & GUTTER		0 LIN FT	\$30.00 / LIN FT	\$0
SUBBASE GRAN MATL TY C	(~ 3.48")	1,730 TONS	\$25.00 / TON	\$43,250
IMPROVED SUBGRADE:	Aggregate Width = 82.0	37,674 SQ YD	\$7.00 / SQ YD	\$263,718
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0
PAVEMENT REMOVAL		22,053 SQ YD	\$15.00 / SQ YD	\$330,795
SHOULDER REMOVAL		14,702 SQ YD	\$10.00 / SQ YD	\$147,020
Note: * Denotes User Supplied Quantity			RIGID CONSTRUCTION	\$3,310,778
			RIGID CONSTRUCTION	\$172,421

MAINTENANCE COSTS: ITEM	THICKNESS	MATERIAL	T	UNIT COST
ROUTINE MAINTENANCE ACTIVITY				\$0.00 / LANE-MILE / YEAR
HMA POLICY OVERLAY	(2.50")		2.50	
HMA POLICY OVERLAY PVMT	(2.50")	1.0087	2.50	\$12.07 / SQ YD
HMA SURFACE MIX	(1.50")	1.0052	Surface M 1.50	\$7.49 / SQ YD
HMA BINDER MIX	(1.00")	1.0139	Leveling Binc 1.00	\$4.58 / SQ YD
HMA POLICY OVERLAY SHLD	(2.50")		Shoulder 2.50	\$10.08 / SQ YD
CLASS A PAVEMENT PATCHING				\$195.00 / SQ YD
CLASS B PAVEMENT PATCHING				\$150.00 / SQ YD
CLASS C SHOULDER PATCHING				\$145.00 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)		Surface M	1.50	\$77.45 / SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.50")		Surface M	2.50	\$82.42 / SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				\$2.00 / LIN FT
CENTERLINE JOINT ROUT & SEAL				\$2.00 / LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL				\$2.00 / LIN FT
RANDOM CRACK ROUT & SEAL		(100% Rehab = 100.00' /		\$2.00 / LIN FT

RIGID TOTAL LIFE-C	\$3,784,672
RIGID TOTAL ANNUAL	\$197,101

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Re #####

		JPCP		HMA
		PRESENT '1	ANNUAL C	
CONSTRUCTION	INITIAL COST	\$3,310,778		\$2,279,849
		\$172,421		\$118,732
MAINTENANCE	LIFE-CYCLE COST	\$473,894		\$867,881
		\$24,680		\$45,198
TOTAL	LIFE-CYCLE COST	\$3,784,672		\$3,147,730
		\$197,101		\$163,930

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	===== HMA	\$163,930	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PE JPCP	\$197,101	20.2%

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FULL-DEPTH HMA PAVEMENT
HMA OVERLAY OF RUBBLIZED PCC PAVEMENT
Figure 54-7.C
STANDARD DESIGN

MAINTENANCE ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 5						
LONG SHLD JT R&S	100.00%	16,540	LIN FT	\$2.00	\$33,080	
CNTR LINE JOINT R&S	100.00%	24,810	LIN FT	\$2.00	\$49,620	
RNDM / THRM CRACK R&S	50.00%	9,097	LIN FT	\$2.00	\$18,194	
PD PVMT PATCH M&F SURF	0.10%	22	SQ YD	\$79.93	\$1,759	
PWFn =	0.8626		PW =	0.8626 X	\$102,653	\$88,549
YEAR 10						
LONG SHLD JT R&S	100.00%	16,540	LIN FT	\$2.00	\$33,080	
CNTR LINE JOINT R&S	100.00%	24,810	LIN FT	\$2.00	\$49,620	
RNDM / THRM CRACK R&S	50.00%	9,097	LIN FT	\$2.00	\$18,194	
PD PVMT PATCH M&F SURF	0.50%	110	SQ YD	\$79.93	\$8,793	
PWFn =	0.7441		PW =	0.7441 X	\$109,687	\$81,617
YEAR 15						
MILL PVMT & SHLD 2.00"	100.00%	36,756	SQ YD	\$3.00	\$110,268	
PD PVMT PATCH M&F ADD'L 2.00"	1.00%	221	SQ YD	\$79.04	\$17,467	
HMA OVERLAY PVMT 2.00"	100.00%	22,053	SQ YD	\$10.00	\$220,608	
HMA OVERLAY SHLD 2.00 "	100.00%	14,702	SQ YD	\$8.06	\$118,559	
PWFn =	0.6419		PW =	0.6419 X	\$466,902	\$299,687
YEAR 20						
LONG SHLD JT R&S	100.00%	16,540	LIN FT	\$2.00	\$33,080	
CNTR LINE JOINT R&S	100.00%	24,810	LIN FT	\$2.00	\$49,620	
RNDM / THRM CRACK R&S	50.00%	9,097	LIN FT	\$2.00	\$18,194	
PD PVMT PATCH M&F SURF	0.10%	22	SQ YD	\$79.93	\$1,759	
PWFn =	0.5537		PW =	0.5537 X	\$102,653	\$56,836
YEAR 25						
LONG SHLD JT R&S	100.00%	16,540	LIN FT	\$2.00	\$33,080	
CNTR LINE JOINT R&S	100.00%	24,810	LIN FT	\$2.00	\$49,620	
RNDM / THRM CRACK R&S	50.00%	9,097	LIN FT	\$2.00	\$18,194	
PD PVMT PATCH M&F SURF	0.50%	110	SQ YD	\$79.93	\$8,793	
PWFn =	0.4776		PW =	0.4776 X	\$109,687	\$52,387
YEAR 30						
NON-INTERSTATE						
MILL PVMT & SHLD 2.00"	100.00%	36,756	SQ YD	\$3.00	\$110,268	
PD PVMT PATCH M&F ADD'L 2.00"	2.00%	441	SQ YD	\$79.04	\$34,854	
PD SHLD PATCH M&F ADD'L 2.00"	1.00%	147	SQ YD	\$78.06	\$11,475	
HMA OVERLAY PVMT 2.25 "	100.00%	22,053	SQ YD	\$10.92	\$240,863	
HMA OVERLAY SHLD 2.25 "	100.00%	14,702	SQ YD	\$9.07	\$133,379	
PWFn =	0.4120		PW =	0.4120 X	\$530,839	\$218,699
YEAR 35						
LONG SHLD JT R&S	100.00%	16,540	LIN FT	\$2.00	\$33,080	
CNTR LINE JOINT R&S	100.00%	24,810	LIN FT	\$2.00	\$49,620	
RNDM / THRM CRACK R&S	50.00%	9,097	LIN FT	\$2.00	\$18,194	
PD PVMT PATCH M&F SURF	0.10%	22	SQ YD	\$79.93	\$1,759	
PWFn =	0.3554		PW =	0.3554 X	\$102,653	\$36,481
YEAR 40						
LONG SHLD JT R&S	100.00%	16,540	LIN FT	\$2.00	\$33,080	
CNTR LINE JOINT R&S	100.00%	24,810	LIN FT	\$2.00	\$49,620	
RNDM / THRM CRACK R&S	50.00%	9,097	LIN FT	\$2.00	\$18,194	
PD PVMT PATCH M&F SURF	0.50%	110	SQ YD	\$79.93	\$8,793	
PWFn =	0.3066		PW =	0.3066 X	\$109,687	\$33,625
						\$867,881
ROUTINE MAINTENANCE ACTIVITY		3.13	Lane Miles	0.00	\$0	\$0
45 YEAR LIFE CYCLE	CRFn = 0.0407852				MAINTENANCE MAINTENANCE	\$867,881 \$45,198

JOINTED PLAIN CONCRETE PAVEMENT
UNBONDED JOINTED PLAIN CONCRETE OVERLAY
Figure 54-7.A

MAINTENANCE ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 10						
PAVEMENT PATCH CLASS B	0.10%	22	SQ YD	\$150.00	\$3,300	
PWF _n =	0.7441		PW =	0.7441 X	\$3,300	\$2,456
YEAR 15						
PAVEMENT PATCH CLASS B	0.20%	44	SQ YD	\$150.00	\$6,600	
PWF _n =	0.6419		PW =	0.6419 X	\$6,600	\$4,236
YEAR 20						
PAVEMENT PATCH CLASS B	2.00%	441	SQ YD	\$150.00	\$66,150	
SHOULDER PATCH CLASS C	0.50%	74	SQ YD	\$145.00	\$10,730	
LONGITUDINAL SHLD JT R&S	100.00%	16,540	LIN FT	\$2.00	\$33,080	
CENTERLINE JT R&S	100.00%	24,810	LIN FT	\$2.00	\$49,620	
PWF _n =	0.5537		PW =	0.5537 X	\$159,580	\$88,356
YEAR 25						
PAVEMENT PATCH CLASS B	3.00%	662	SQ YD	\$150.00	\$99,300	
SHOULDER PATCH CLASS C	1.00%	147	SQ YD	\$145.00	\$21,315	
PWF _n =	0.4776		PW =	0.4776 X	\$120,615	\$57,606
YEAR 30						
NON-INTERSTATE						
PAVEMENT PATCH CLASS B	4.00%	882	SQ YD	\$150.00	\$132,300	
SHOULDER PATCH CLASS C	1.50%	221	SQ YD	\$145.00	\$32,045	
HMA POLICY OVERLAY 2.5" (PVMT)	100.00%	22,053	SQ YD	\$12.07	\$266,181	
HMA POLICY OVERLAY 2.5" (SHLD)	100.00%	14,702	SQ YD	\$10.08	\$148,198	
PWF _n =	0.4120		PW =	0.4120 X	\$578,724	\$238,427
YEAR 35						
NON-INTERSTATE						
LONGITUDINAL SHLD JT R&S	100.00%	16,540	LIN FT	\$2.00	\$33,080	
CENTERLINE JT R&S	100.00%	24,810	LIN FT	\$2.00	\$49,620	
RANDOM CRACK R&S	50.00%	8,270	LIN FT	\$2.00	\$16,540	
REFLECTIVE TRANSVERSE CRACK R&S	40.00%	5,299	LIN FT	\$2.00	\$10,598	
PD PVMT PATCH M&F HMA 2.50"	0.10%	22	SQ YD	\$82.42	\$1,813	
PWF _n =	0.3554		PW =	0.3554 X	\$111,651	\$39,679
YEAR 40						
NON-INTERSTATE						
PAVEMENT PATCH CLASS B	0.50%	110	SQ YD	\$150.00	\$16,500	
LONGITUDINAL SHLD JT R&S	100.00%	16,540	LIN FT	\$2.00	\$33,080	
CENTERLINE JT R&S	100.00%	24,810	LIN FT	\$2.00	\$49,620	
REFLECTIVE TRANSVERSE CRACK R&S	60.00%	7,949	LIN FT	\$2.00	\$15,898	
RANDOM CRACK R&S	50.00%	8,270	LIN FT	\$2.00	\$16,540	
PD PVMT PATCH M&F HMA 2.50"	0.50%	110	SQ YD	\$82.42	\$9,066	
PWF _n =	0.3066		PW =	0.3066 X	\$140,704	\$43,134
						\$473,894
ROUTINE MAINTENANCE ACTIVITY		3.13	Lane Miles	\$0.00	\$0	\$0
45 YEAR LIFE CYCLE	CRF _n = 0.0407852				MAINTENANCE MAINTENANCE	\$473,894 \$24,680